MULTIMEDIA EXTENSIONS TO THE DOD MINIMUM DESKTOP CONFIGURATION

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Center for Standards
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FOREWORD

FOR ALL EXECUTIVES

The **Multimedia Extensions to the DoD Minimum Desktop Configuration** has been prepared by the Defense Information Systems Agency (DISA), Joint Interoperability and Engineering Organization (JIEO), Center for Standards (CFS). It is intended for use by DoD acquisition personnel involved in the procurement of multimedia computing hardware and software. The document will be updated semiannually.

Comments, suggestions, or questions regarding the **Multimedia Extensions to the DoD Minimum Desktop Configuration** should be addressed to DISA/JIEO/CFS, 10701 Parkridge Boulevard, Reston, VA 22091-4398. Additional copies may be obtained by writing to this same address.

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I. INTRODUCTION

This document is one in a series of informal guidelines developed at the request of the DoD Multimedia Standards Working Group (MSWG).[1] The members of the MSWG indicated a need for acquisition guidance regarding computing systems for use in multimedia applications.

The purpose of this document is to provide an addendum to the DOD Minimum Desktop Configuration[2] (MDC) addressing additional requirements related to multimedia. An additional configuration for multimedia development is provided, along with clarification of end-user configuration requirements and interim practices for interactive courseware. The intended use of these configurations is to support new system acquisition. There is no intent to convey the impression that multimedia development or use is not possible on anything less nor ever requires anything more. These configurations will not be appropriate for every possible application. These specifications, therefore, define what makes sense for most cases where new equipment will need to be used for several years doing reasonably ordinary multimedia tasks. Refer to the MDC for details not addressed in these extensions.

The specifications contained in these configurations are intended to be vendor neutral. The Annex contains information regarding the translation of some of the more cryptic aspects of the specification into the common world of Personal Computers. Also included are interim standards and practices for interactive courseware, to enhance its portability among different desktop computer systems.

The recommendations in this document were developed as a result of personal experiences and discussions with developers, users, and other technical professionals, and are expected to remain valid for no more than two years. In general, the main reason desktop computer systems need to be enhanced or replaced is that new software and new generations of existing software contain new features that make use of expanded hardware capabilites. Before acquiring any hardware, it is important to know the requirements of the software that will run on it. To protect against obsolescence too soon, known demands should use no more than 50% of capacity. For example, if the current generation of the intended application software plus operating system require 8 megabytes (MB) of main memory, new computers should have at least 16 MB. Moreover, the *minimum* acceptable hardware specifications indicated by a software product should never be used for this calculation. Use the *recommended* specifications instead.

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1. The MSWG, organized under the auspices of the DISA Center for Standards, includes representatives from all Services and many DoD Agencies, and is open to all interested DoD organizations. Other documents in this series will address software standards for Interoperability and portability.

This document was reviewed and approved by the MSWG on September 7, 1995. It will be updated at the direction of the MSWG from time to time.

2. Edmonds, Albert J., "DOD Minimum Desktop Configurations" Memorandum for Assistant Secretary of Defense (Command, Control, Communications and Intelligence), 25 January 1995.

II. DEVELOPMENT CONFIGURATION

The recommended capabilities for a multimedia development system are substantially higher in performance than the MDC for two main reasons. First, for maximum quality in the output, today and as products may be reused in the future, the data formats used during the development process should retain very high levels of quality through to the final step of generating the end-user product. Less capable systems will encourage developers to introduce lower levels of quality earlier in the process because the differences will not be apparent to the developer. Second, the "raw horsepower" demands of multimedia authoring systems tend to be quite high due to the sheer volume of data being manipulated. Less capable systems may be used, but the developer will spend a lot of time waiting for the system to carry out the various steps of the development process.

Recommended minimum configuration for multimedia:

- Central Processing Unit with the following criteria
  - at least 32-bit data path
  - at least 256K cache memory
  - SPECint92 rating of greater than or equal to 100
  - SPECfp92 rating of greater than or equal to 70
- 32MB of RAM (expandable to 128MB)
- Hard disk drive(s) with a capacity of at least 2GB with a burst transfer data rate of 10 MB per second or better. (Note: transfer rate specification applies to the disk controller and the bus on which it resides, as well as the drive itself.) Average access time should be 10 ms or less.
- A 3.5" floppy disk drive capable of reading and writing 1.44MB and reading 720KB diskettes
- A display controller capable of a minimum of 64K colors, 1280x1024 pixels, non-interlaced resolution at 72Hz refresh rate.
- 101-key keyboard
- Mouse
- Network interface
- Minimum quad speed CD-ROM drive
- External storage backup device (tape or removable hard disk, including magnetic, magneto-optical, optical, etc.) of 500MB capacity or more (a dual-speed CD-writable may also serve as the CD-ROM drive if dual-speed reading is acceptable)
- 16-bit stereo, 44.1 KHz sound

- o Sufficient serial, parallel, and SCSI ports and extra slots to support all desired peripherals with room for future growth
- o External stereo speakers or headphones

Optional components:

- o Scanner: minimum 1200 dpi (with software-selectable lesser densities), 24 bit color, full page (8.5x11") flatbed (may also require multi-sheet feeder for some applications)
- o Pen-based drawing tablet
- o Video capture of NTSC video at 30 frames per second, 24 bit color (lesser specifications may be acceptable for certain applications) with on-the-fly compression to Motion JPEG with software-controlled variable compression ratio. Audio separation may be required for some applications.
- o Stereo audio capture at 44.1 KHz from external microphones and midi devices
- o Wave table and MIDI support in the audio output
- o Video output to Super VHS and NTSC
- o CD-R compatible CD-ROM writer
- o MPEG I encoding
- o TV tuner
- o Microphones, video camera, VHS video tape recorder, digital still camera
- o Color printer

III. END-USER CONFIGURATION CLARIFICATIONS

The specification provided in the MDC are generally adequate for the simplest case of playback of multimedia data, say from a CD-ROM. Video, however, will be limited to relatively small windows, and video presentation may be very jerky unless the window is very small indeed. The following modifications to the MDC are recommended to meet performance needs for a wider range of multimedia products:

- o Disk drive access time should be less than 13 ms
- o Video display controller should be capable of 64k colors at 1024x768
- o 16-bit sound card should be capable of audio playback at 44.1 KHz stereo with optional wave table support
- o CD-ROM drives should be attached to a high-speed bus (such as a SCSI-2 or PCI bus), not to a proprietary interface on the sound card, but there should be a direct audio connection from the drive to the sound card

o Optional video teleconferencing components: camera, microphone, optional hardware compression/decompression (codec)

IV. INTERIM STANDARDS AND PRACTICES FOR INTERACTIVE COURSEWARE

The following are interim standards for interactive courseware (ICW) that uses the Microsoft Disk Operating System (MS-DOS) or equivalents/successors:

o Operating System with Graphical User Interface. The Interactive Multimedia Association's Recommended Practices for Multimedia Portability, V1.2, describes the software interfaces and related commands for ensuring ICW portability in the MS-DOS environment. This environment should be used when available hardware does not permit the use of a graphical user interface (GUI). If available hardware permits the use of a GUI, ICW should use Microsoft Windows 3.1 and equivalent/successor systems (hereafter called MS-Windows). MS-Window provides the necessary interface to support almost all peripheral devices used by ICW programs. When MS-Windows is used, developers should ensure the portability of MS-Windows ICW across the widest range of MS-Windows platforms. In general, using only documented MS-Windows application programming interface (API) features and requiring minimum system hardware resources will lead to maximum portability. ICW should not use third party extensions to MS-Windows, dynamic link libraries (DLLs), fonts, authoring systems, run-time libraries, MS-Windows programs, or any other software that cannot be distributed with ICW on a royalty-free basis. To enhance portability to future MS Windows environments and to non-Intel hardware architectures, ICW should use Microsoft's Win32 software interface whenever possible.

o Text. Text used in ICW should include the following: American Standards Committee for Information Exchange (ASCII) and Rich Text Format (RTF). These kinds of text can be converted easily among a wide variety of text processors.

o Graphics. ICW should be developed to run in the following Video Graphic Array (VGA) modes: 640x480 pixels with 16 colors or 640x480 pixels with 256 colors. The use of more colors will limit portability; think twice about that limitation before developing ICW with 65,000 or 16,000,000 colors. ICW that requires higher resolutions such as 1280x1024 or 1024x768 will limit portability and should be restricted to those instances where such capabilities are essential, as defined by a rigorous instructional design specification. When these higher resolutions are required and MS-Windows is used, portability will be enhanced if the information is partitioned for sequential presentation in separate windows, and if no window is larger than 640x480 pixels. ICW that uses the Super VGA modes under MS-DOS should use the Video Electronics Standards Association (VESA) Super VGA BIOS Extension (VBE) version 1.2 or higher. ICW programs intended to operate under MS-Windows should be compatible with Microsoft's Graphics Device Interface (GDI), the graphics interface used in MS-Windows systems. Bitmap and

vector graphic images should be archived in one of the following generally available formats:

BITMAP FORMATS	VECTOR FORMATS
Compuserve Bitmap (GIF)	Computer Graphics Metafile (CGM)
TIFF 5.0 Bitmap (TIF)	Encapsulated Postscript (EPS)
Windows Bitmap (BMP)	Windows Metafile (WMF)
Paintbrush (PCX)	DXF (Autodesk CAD exchange format)
Targa (TGA)	
Joint Photographer's Expert Group (JPEG)	

o Interactive Videodisc (IVD). ICW incorporating IVD should be based on the LaserVision standards for analog optical videodisc. ICW intended for operation under MS-Windows should use Microsoft's Multimedia Control Interface (MCI) to communicate with a video overlay board and an analog videodisc player.

o Digital Audio. ICW incorporating digital audio should be based on the linear pulse code modulation (PCM) standard, and should use either 44.1 kiloHertz (kHz) PCM, 22.05 kHz PCM or 11.025 kHz PCM. Where possible, ICW should use either 22.05 kHz PCM or 11.025 kHz PCM, and should be stored in MS-Windows wave (WAV) files. The use of 8-bit audio should be considered instead of 16-bit audio whenever it can provide adequate audio quality, because 8-bit audio is more portable.

o Synthesized Audio. ICW using synthesized audio should be based on the Musical Instrument Digital Interface (MIDI) standard. ICW should support the General MIDI patch map and MIDI data should use this map. MIDI data should be supplied in General MIDI Type 1 files.

o Compact Disc Read-only Memory (CD-ROM). ICW requiring CD-ROM should use drives with the standard Compact Disc Digital Audio (CD-DA) "Red Book" (IEC 908) capability and Microsoft CD-ROM Extensions (MSCDEX) version 2.2 or later. CD-ROMs should conform with the International Standards Organization (ISO) 9660 and 10149 specifications.

o Digital Video. If digital video is used, it will be more portable if it doesn't require add-on hardware, and it should use one of the following file formats:

Audio Video Interleave (AVI)

Moving Pictures Experts Group (MPEG-1)

Quicktime

Archiving ICW:

o Regardless of the format used to deliver ICW, a record copy of all ICW and modifications shall be prepared and stored by the Component in a format that is readily accessible to other potential users. Archiving all original recording media is strongly recommended.

o All digital information (e.g., ICW control programs, graphics text files) in the record copy shall be stored using the operating system standard directory structure, allowing digital information to be transferred using standard operating system utilities.

o All analog information in the record copy (e.g., source video and audio used in the ICW program) shall be stored using conventional storage media, and shall be of such quality that it is usable for reproduction. Include analog sources for digital video and audio data, when available.

o Include MCI device drivers when archiving MS-Windows ICW.

o When archiving, err on the side of saving too much data as opposed to too little.

o If data is compressed to minimize disk storage requirements, it should be stored in a self-extracting form. The decompression must be royalty free and capable of decompression to both original and relative directory and drive locations.

Existing ICW programs:

o ICW programs already developed shall be made to conform with this instruction if economically feasible or phased out at the end of their useful lives.

o All existing programs shall comply with the reporting requirements for the Defense Instructional Technology Information System.

Existing programs that require the Government to pay royalties, recurring license or run-time fees, use tax, or similar additional payments for ICW, associated presentation programs necessary to interpret and execute the ICW, documentation, or associated training materials developed for the Department of Defense shall be made to conform with the DOD Instruction 1322.20 prohibition of such additional costs at the most advantageous time for renegotiation of that contract clause.

ANNEX

The intended relationship of the developer configuration specifications in the main body of this document to Personal Computers (based on Intel x86 architecture) is provided in Table 1. It must be noted that this does not constitute an endorsement of any brand names. It merely responds to the request from the membership of the MSWG, particularly within the training community, to recognize that PCs are the most common platform architecture available to DoD purchasers.

Table 1. Developer Personal Computer Equivalent Specifications

Configuration Specification	Personal Computer Specification
CPU	Pentium 90 or better
Hard disk drive	Enhanced IDE with mode 3 timing (11.1 MB per second burst rate) or SCSI-2 (NOTE: SCSI-2 does not guarantee 10 MB/sec transfer; the specific drive specifications must be considered)
Device bus	PCI or SCSI-2
Mouse	Three buttons is better then two
Audio	SoundBlaster compatible 16-bit with wave table capability
CD-ROM	PCI or SCSI-2 interface
Video display controller	64-bit data path, at least 2 MB video RAM (4 MB is better)

The intended relationship of the user configuration specifications in the main body of this document to the PC architecture is provided in Table 2.

Table 2. User Personal Computer Equivalent Specifications

Configuration Specification	Personal Computer Specification
CPU	i486DX2-66 MHz
Device bus	PCI or SCSI-2
Audio	SoundBlaster compatible 16-bit with wave table capability
CD-ROM	PCI or SCSI-2 interface
Video display controller	64-bit data path, at least 2 MB video RAM